

extensive use of sodium iodid intravenously. However, it is to be hoped that any such objection would not cause hesitancy in first choosing the foreign protein therapy in a like instance.

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H. J. TEMPLETON, M. D. (3115 Webster Street, Oakland).—The disapproval by the essayists of the theory that actinomycosis is caused by the chewing of straws, etc., illustrates the point that was recently made in the article, "The Perpetuation of Error in Dermatological Teaching," for this theory has been handed down from textbook to textbook.

In view of the reported excellent results in treatment of blastomycosis and coccidioidal granuloma by means of potassium antimony tartrate intravenously, it might be well to try this drug in actinomycosis.

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ROY W. HAMMACK, M. D. (1003 Pacific Mutual Building, Los Angeles).—The study of the organism in this type of granuloma is interesting though often difficult. While in some cases the organism is readily cultivated by proper methods, in others repeated efforts have, in my experiences, failed. The possibility of this type of granuloma being caused by some other organism than *Actinomyces bovis* is borne out by two cases in my experience. One was clinically actinomycosis of the jaw. Granules were found in the pus from the sinuses and these resembled *Actinomyces*. However, the organism could be readily cultivated aerobically, as was repeatedly shown. Its appearance in cultures was different from that of *Actinomyces bovis*, but it was not definitely classified. Another was a granuloma of the abdominal wall with sinuses in which granules appeared. These granules were much larger than typical *Actinomyces* granules and were brown in color. Microscopically they resembled *Actinomyces*, but efforts to cultivate them failed.

The treatment of these infections is always unsatisfactory and tries the patience of both patient and physician. The use of foreign protein therapy is new to me, but since the results in the case reported were so gratifying I believe it is worthy of further trial.

RECONSTRUCTION OF LONG BONES*

By HARLAN SHOEMAKER, M. D.
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DISCUSSION by E. W. Cleary, M. D., San Francisco;
Edgar L. Gilcreest, M. D., San Francisco.

THE fundamental requirement of good orthopedics is perfect equilibrium. When the balance of the body is disturbed through shortening of the long bones of the legs, many compensatory rotations in the pelvis and spine must follow. Reconstruction of a long bone following accident accordingly becomes a matter of great importance to the individual, particularly if that person is within the first three decades of life. A number of factors are involved, and a number of conditions may exist which modify the method of procedure or alter the time of active interference. Multiple fractures, skin abrasions, and shock are chief among these.

I have divided the consideration of the reconstruction of the long bones into the immediate replacement after fracture and the reconstruction of all fractures or malunions.

IMMEDIATE REPLACEMENT

Immediate replacement of the fractured long bone could include that time up to three weeks

following the injury, as the callus has not sufficiently set to be an obstacle, and the associated injuries to the soft tissues have nearly subsided. Extensive lacerations should delay an active attack upon a bone. An old compound fracture, however, should only be approached nine months after all sinuses have healed and all moisture, however slight, has disappeared.

Avoidance of Shock.—The overcoming of muscle and tendon contractures, rotation, angulation, overriding, nonunion, as well as changes in the blood vessels and nerves, are the principal factors that must be dealt with in order to avoid shock with a possible fatal termination.

Muscle and tendon contracture can best be overcome by flexion of the leg at the knee. Gravity at a time when the bone has solidified will greatly aid subsequent treatment to overcome these contractures, and with less pain and less discomfort than the forcible pressure of casts maintaining a strained though correct anatomical position.

Failure to correct rotation of the femur is inexcusable and frequently ridiculous if it were not so disabling. To see a bowlegged workman attempt to climb a ladder with an inwardly rotated malunited femur which throws the flexed knee into a genu valgum illustrates this point. The underlying factors come generally from setting the foot too straight in the cast with an accompanying outward rotation of the upper fragment of the femur.

Angulation is one of the least disturbing factors in union of the femur, and certainly one of the most frequent. If lateral or anterior, the deformity has been accompanied by rupture of the soft tissues in these directions. If the angulation is posterior or inward, and particularly if near the knee-joint, it must be corrected. Pads, wedges and alteration of the case alignment or braces are all useful methods to combat this complication.

Overriding of the long bones should always be corrected. This is most essential in the young. The tiring effect of a waddling gait extends throughout every joint in the body and is evidenced by the lurch of the torso and head.

Open Reduction.—If skin traction fails to reduce an overlapping fracture within three weeks, or manipulation under the fluoroscope with moderately forced traction fails to engage a bone, then open reduction is justifiable.

RECONSTRUCTION OF MALUNIONS

Nonunions are occasionally met with. They are generally encountered when multiple fractures accompany the injury or where serious compounding has occurred. Lack of coöperation of the patient plays a very small part except possibly as regards irregularities in diet with the tendency to overindulge in carbohydrates, particularly the sugars, and failure to take sufficient vitamins in fresh vegetables, fruits, and fruit juices.

Internal fixation may be produced by a foreign body, grafts or plastic work. When muscle tension, angulation or obliquity of the fracture are

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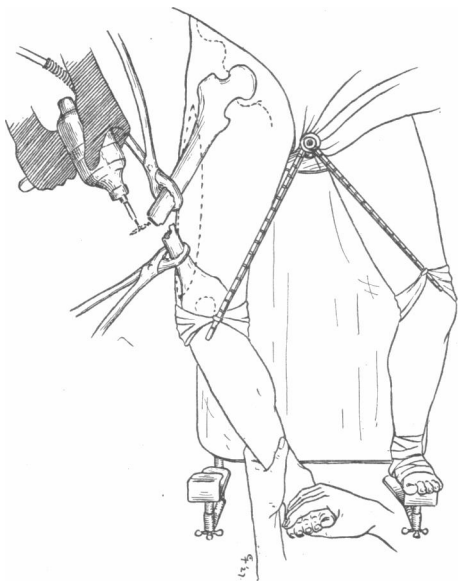
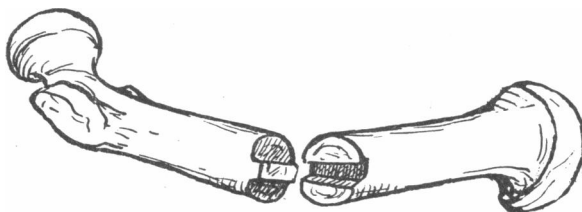


Illustration shows angulation of femur and flexion of the knee to facilitate reduction, without traction on the vessels or nerves. Note absence of traction, the foot being held by an assistant.



Lateral view.

Showing facets cut to secure immobilization of long bone.

encountered, an internal fixation by a foreign body may be acceptable.

A bone graft is a necessity often added to the mechanics of correcting an obvious deformity. A well-cut bone graft will frequently firmly hold a bone and produce the desired permanent union. Exuberant callus occasionally will follow this procedure.

Plastic work on the ends of the severed femur has been most satisfactory in my own practice. The bone should be so cut by the saw or chisel that the roughest shaking will not disengage or alter the alignment. Further fixation is unnecessary and only the soft tissues and skin need be closed with plain zero catgut.

The facets cut upon the bone do not necessarily need to shorten the bone, neither is it necessary that they follow any preconceived plan.

After the soft tissues are closed and dressed, a cast from the opposite knee to the foot on the injured leg is applied. The cast is supported by a truss between the thighs, giving it a shape similar to a capital A with one long leg. The walking Thomas splint is adjusted after the tenth week, regardless of the condition of the union, and then the patient is gotten into an ambulatory condition as soon as the myocardium permits. When

the knee-joint is injured simultaneously with the femur, a brace is adapted into the cast and early passive motion begun on the injured knee.

In the femur there are two safe avenues of approach. My first selection would be beneath the intermuscular septum on the external surface of the thigh. Here neither muscles, nerves or blood vessels interfere with a rapid exposure of the bone.

The second choice is through the intermuscular septum on the inner aspect of the thigh. The incision is carried down to the bone between the adductor longus and magnus internally and the internal head of the quadriceps extensor femoris muscle. The great vessels and the obturator nerve lie to the mesial side of the leg and must not be injured when the bone is exposed. Neither should the extensor quadriceps muscle or anterior femoral nerve be injured if full extension of the leg is to be maintained.

Undue stretching of the blood vessels and nerves is undoubtedly the chief cause of shock and death. *Metatarsalgia* is a condition that may develop in the foot of not so grave a nature to the patient as it is troublesome and prolonged, and which has its origin in the stretched nerve. It may be a terminal reaction from too rough handling or too prolonged or sudden tension upon the sciatic nerve. James B. Mennell, M. D., of St. Thomas' Hospital, says: "No thoughtful worker in the massage department of a military hospital can fail to notice one blot that remains in our treatment of gunshot wounds of bones. The structural repair of the bone itself is, generally speaking, incomparably better now than it was in the early stages of the war. But our patients are likely to return us small thanks, if, while we restore length and form to a femur, we doom them to the curse of a hallux rigidus or metatarsalgia. Almost better is a shortened leg and painless foot than a perfect leg and a foot that will never again carry its owner any distance without pain."

The avoidance of shock during these manipulations is best accomplished by undue traction upon the vessels or nerves. During manipulation of the overlapping bone by a "jackknife" procedure, one assistant holds the leg flexed at the knee and free from tension at all times. The assistant holding the leg can aid the operator materially if it becomes necessary to drag the femur out of its bed in order to cut dovetails into the bone that will hold it fast when set.

With the jackknifing of the ends of the femur and the flexion of the leg at the knee-joint lies the success of a rapid reduction of a fracture without shock.

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DISCUSSION

E. W. CLEARY, M. D. (177 Post Street, San Francisco).—Doctor Shoemaker's paper is timely. We cannot have too much discussion of this important subject. As the World War experience recedes, one notes a tendency to forget some of its dearly bought lessons.

In the dregs of the great battlefields men saw this reconstruction problem as they had not seen it before.

A hundred, five hundred, a thousand maimed men seen en masse forcibly demanded the elimination of carelessness and mishandling and the institution of better methods and higher standards.

Splint standardization, immobilization at the earliest practical moment, skeletal traction, traction-suspension in frames of the Balkan type prevented countless deformities and saved hundreds of lives.

These methods were widely applied to industrial injuries after the war, and with similar good results. Then began an insidious, but no less dangerous drift back toward obsolete prewar methods. The human wreckage of civil industry is not disclosed en masse as was the human wreckage of war. The newer and better methods are a far greater tax upon the time and ability of the surgeon. Their application usually costs more in primary and obvious expense than do perfunctory and obsolete methods. The salvage value of high standard reconstruction surgery is often obscured when the price of life and limb is set as low as present custom tends to place it in industrial workers.

Doctor Shoemaker has clearly pointed out that shortening, angulation, malunion and stiff joints must be avoided. He has warned us against shock and hemorrhage, and has stressed the value of efficient early manipulative reduction. One could wish that space had permitted him to speak in some detail of modern methods of splinting, skeletal traction and suspension which, if efficiently applied, go so far toward avoiding disasters and toward facilitating reconstruction of fractured long bones.

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EDGAR L. GILCREEST, M. D. (384 Post Street, San Francisco).—I wish Doctor Shoemaker might have emphasized more the importance of immediate replacement after fracture. Under this caption he arbitrarily includes that time from the day of injury up to three weeks. I believe that we should urge more and more very early reduction. In fact, I believe that we should teach our students that a fracture is an acute emergency. It is an erroneous and pernicious idea that one should wait until the swelling subsides before attempting reduction. Immediate or very early reduction often prevents much swelling. Repair does not go on indefinitely; sooner or later it ceases; therefore it must be conserved and not wasted.

In accomplishing these reductions Doctor Shoemaker has pointed out how to avoid shock. This should always be borne in mind. Frequently in fracture cases too little attention is paid to the trauma of the surrounding tissues. There is no simple fracture. Every fracture is accompanied by varying degrees of contusion and laceration and of hemorrhage into the adjacent structures.

The cause of unsatisfactory results in reconstruction of the long bones is that too little attention is still given to the consideration of the anatomy and physiology of the part. Since the popularization of the treatment of fractures by extension, exact reduction of the fracture has often been neglected. It is folly to sacrifice the attempt at primary reduction for other methods. Until good reposition has been obtained we should not be satisfied. I have in some cases made three or four attempts before proper reduction and alignment have been secured. As Doctor Shoemaker has so ably pointed out there are a number of fractures which do not permit primary reduction. These lie on the border line between fractures requiring conservative or nonoperative treatment and those requiring operative intervention. The methods pointed out by Doctor Shoemaker have been our allies for years. We should more frequently hesitate to leave the fields of tried and proved experience to go romping after the butterflies of untried methods in our desire for the new and more spectacular. Rather we should perfect ourselves in standardized methods.

SMALLPOX AND VACCINATION*

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DISCUSSION by J. L. Pomeroy, M. D., Los Angeles;
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MODE OF TRANSMISSION

SMALLPOX is a disease that spares no class of people. Its extent cannot be compared with that of typhoid fever, cholera, typhus fever, or tuberculosis, the prevalence of which is effectively lessened by improved methods of sanitation, for the exact mode by which smallpox is conveyed is not definitely understood. No one as yet has discovered the organism or other agent that may be responsible for the disease. For that matter, nobody knows what electricity is, but who cares to play with a live wire? However, it is commonly believed that the infective substance, or virus, as it is called, enters the nose or throat and from these places, through a local injury, enters the blood and causes a general infection of the system. There does not seem to be any doubt that the smallpox virus is contained in the lesions of the skin because direct contact is certain to spread the disease to other persons.

AN ANCIENT AND MODERN SCOURGE

Smallpox was at one time much more common and far more deadly in its ravages than it is now. There are two reasons for this fact. First, a new disease invariably wipes out the population whenever it finds a virgin soil. The scourge travels along like flames that lick dry timber in a burning forest. Second, methods of prevention and treatment of the disease are known today that were unknown in the past.

Introduced into the New World by the Spaniards about fifteen years after the discovery of America, within a short time smallpox had claimed about three and a half million persons in Mexico. More than one-half of the twelve million American Indians were stricken. Later, in the year 1707, almost 40 per cent of the total population of Iceland perished to the number of twenty thousand.

In more recent times, during the years 1893 to 1897, almost four hundred thousand persons died of the disease in sixteen countries and of this number Russia alone lost over 275,000. For many years China had been swept by smallpox and enormous populations wiped out, but today the disease is no longer so deadly, since the pock-marked and disfigured faces of the natives bear witness to the fact that nearly everyone has had the disease and is therefore now immune to another attack. All the previous waste of human life seems the more terrible in view of the simple preventive measure given to us by modern science.

DISCOVERY OF VACCINATION

The prevention of smallpox depends chiefly upon vaccination. It was one of the first weapons

* From the Department of Medicine, University of California Medical School.

* Radio lecture, KFRC, November 5, 1928, sponsored by the University of California Medical School.